

WHAT IS CLAIMED IS:

1. A demodulator with communications link adaptation for use in a communications channel, comprising:
 - said demodulator configured to receive a modulated signal over the communications channel;
 - said demodulator configured to extract clusters from said modulated signal based on an unsupervised clustering technique;
 - said demodulator configured to compute a mean and standard deviation for each extracted cluster;
 - said demodulator configured to determine categories for each extracted cluster based on a training sequence included in said modulated signal; and
 - said demodulator configured to demodulate said modulated signal based on said mean, said standard deviation and said determined categories.
2. The demodulator of claim 1, wherein said demodulator is configured to demodulate said modulated signal using a Bayesian demodulation technique.
3. The demodulator of claim 1, wherein said unsupervised clustering technique comprises a Fuzzy c-Means (FCM) clustering technique.
4. The demodulator of claim 1, wherein said modulated signal comprises a Quadrature Phase Shift Keying (QPSK) modulated signal.
5. The demodulator of claim 4, wherein said categories comprise $+1$, $+j$, -1 and $-j$.
6. The demodulator of claim 5, wherein said demodulator is configured to assign an extracted cluster to said category $+1$ and remaining extracted clusters to categories $+j$, -1 and $-j$ in a counterclockwise order from said cluster assigned to said category 1.
7. The demodulator of claim 1, wherein said demodulator is configured to generate hard decisions as said demodulation is used downstream for at least one of burst extraction and payload extraction.
8. The demodulator of claim 1, wherein said communications channel comprises a satellite communications channel.
9. The demodulator of claim 8, wherein said satellite communications channel comprises a satellite downlink communications channel.
10. The demodulator of claim 1, wherein said communications channel comprises

one of a digital video broadcasting (DVB) communications channel, a terrestrial broadcast communications channel, a cellular communications channel, a Quadrature Phase Shift Keying (QPSK) communications channel, an M-ary Phase-Shift Keying (M-PSK) communications channel, a Quadrature Amplitude Modulation (QAM) communications channel, a Pulse Amplitude Modulation (PAM) communications channel.

11. The demodulator of claim 1, wherein said demodulator is included in a device comprising one of a personal digital assistant (PDA), a personal information assistant (PIA), a personal computer (PC), a laptop PC, a television, an Internet appliance, a cellular phone and a set-top box.

12. A communications system configured to include said demodulator recited in any one of claims 1-11.

13. A demodulation method with communications link adaptation for use in a communications channel, comprising:

receiving a modulated signal over the communications channel;

extracting clusters from said modulated signal based on an unsupervised clustering technique;

computing a mean and standard deviation for each extracted cluster;

determining categories for each extracted cluster based on a training sequence included in said modulated signal; and

demodulating said modulated signal based on said mean, said standard deviation and said determined categories.

14. The method of claim 13, wherein said demodulating step comprises using a Bayesian demodulation technique.

15. The method of claim 13, wherein said extracting step comprises using a Fuzzy c-Means (FCM) clustering technique.

16. The method of claim 13, further comprising configuring said modulated signal as a Quadrature Phase Shift Keying (QPSK) modulated signal.

17. The method of claim 16, further comprising configuring said categories as +1, +j, -1 and -j.

18. The method of claim 17, further comprises:

assigning an extracted cluster to said category +1; and

assigning remaining extracted clusters to categories +j, -1 and -j in a

counterclockwise order from said cluster assigned to said category 1.

19. The method of claim 13, wherein said demodulating step comprises generating hard decisions used downstream for at least one of burst extraction and payload extraction.

20. The method of claim 13, further comprising configuring said communications channel as a satellite communications channel.

21. The method of claim 20, further comprising configuring said satellite communications channel as a satellite downlink communications channel.

22. The method of claim 13, further comprising configuring said communications channel as one of a digital video broadcasting (DVB) communications channel, a terrestrial broadcast communications channel, a cellular communications channel, a Quadrature Phase Shift Keying (QPSK) communications channel, an M-ary Phase-Shift Keying (M-PSK) communications channel, a Quadrature Amplitude Modulation (QAM) communications channel, a Pulse Amplitude Modulation (PAM) communications channel.

23. The method of claim 13, further comprising including said demodulation method in a device comprising one of a personal digital assistant (PDA), a personal information assistant (PIA), a personal computer (PC), a laptop PC, a television, an Internet appliance, a cellular phone and a set-top box.

24. A computer-readable medium carrying one or more sequences of one or more instructions for a demodulation method with communications link adaptation, the one or more sequences of one or more instructions including instructions which, when executed by one or more processors, cause the one or more processors to perform the steps recited in any one of claims 13-23.

25. A demodulation apparatus with communications link adaptation for use in a communications channel, comprising:

- means for receiving a modulated signal over the communications channel;
- means for extracting clusters from said modulated signal based on an unsupervised clustering technique;
- means for computing a mean and standard deviation for each extracted cluster;
- means for determining categories for each extracted cluster based on a training sequence included in said modulated signal; and
- means for demodulating said modulated signal based on said mean, said standard deviation and said determined categories.